Hospital Capacity, Crowding and Ambulance Diversion in Massachusetts

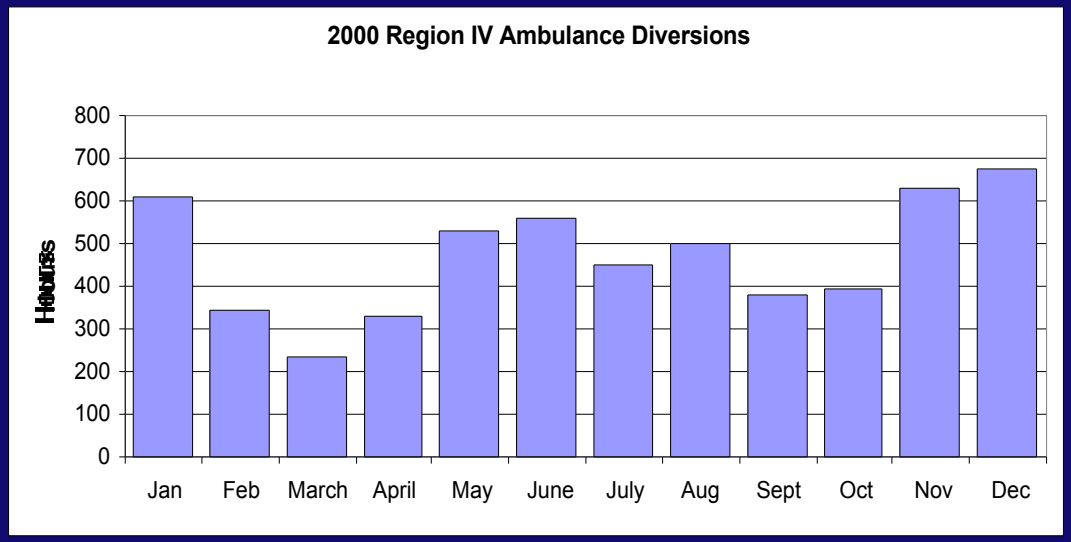
Boston

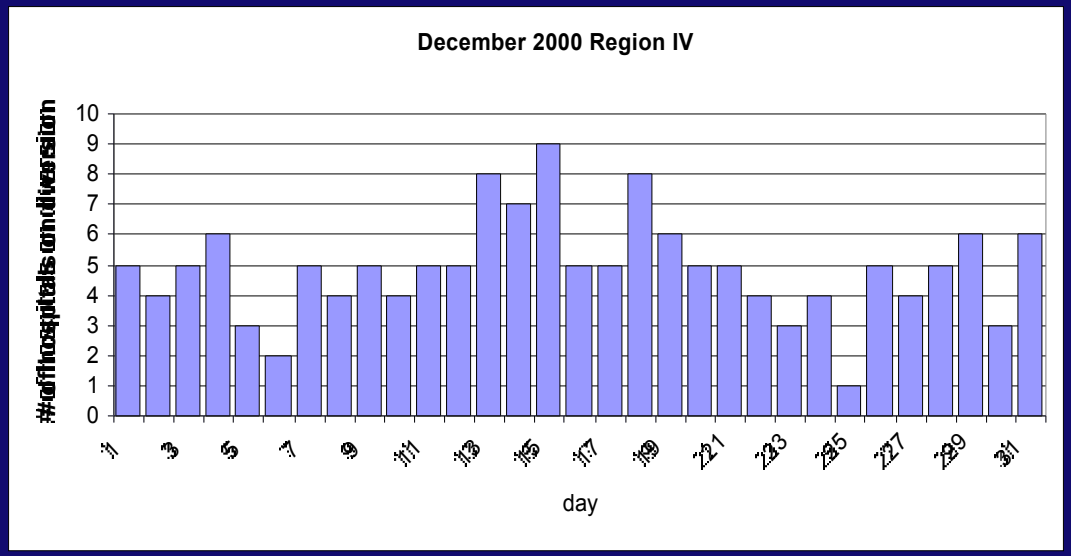
October 15, 2001

What is ambulance diversion?

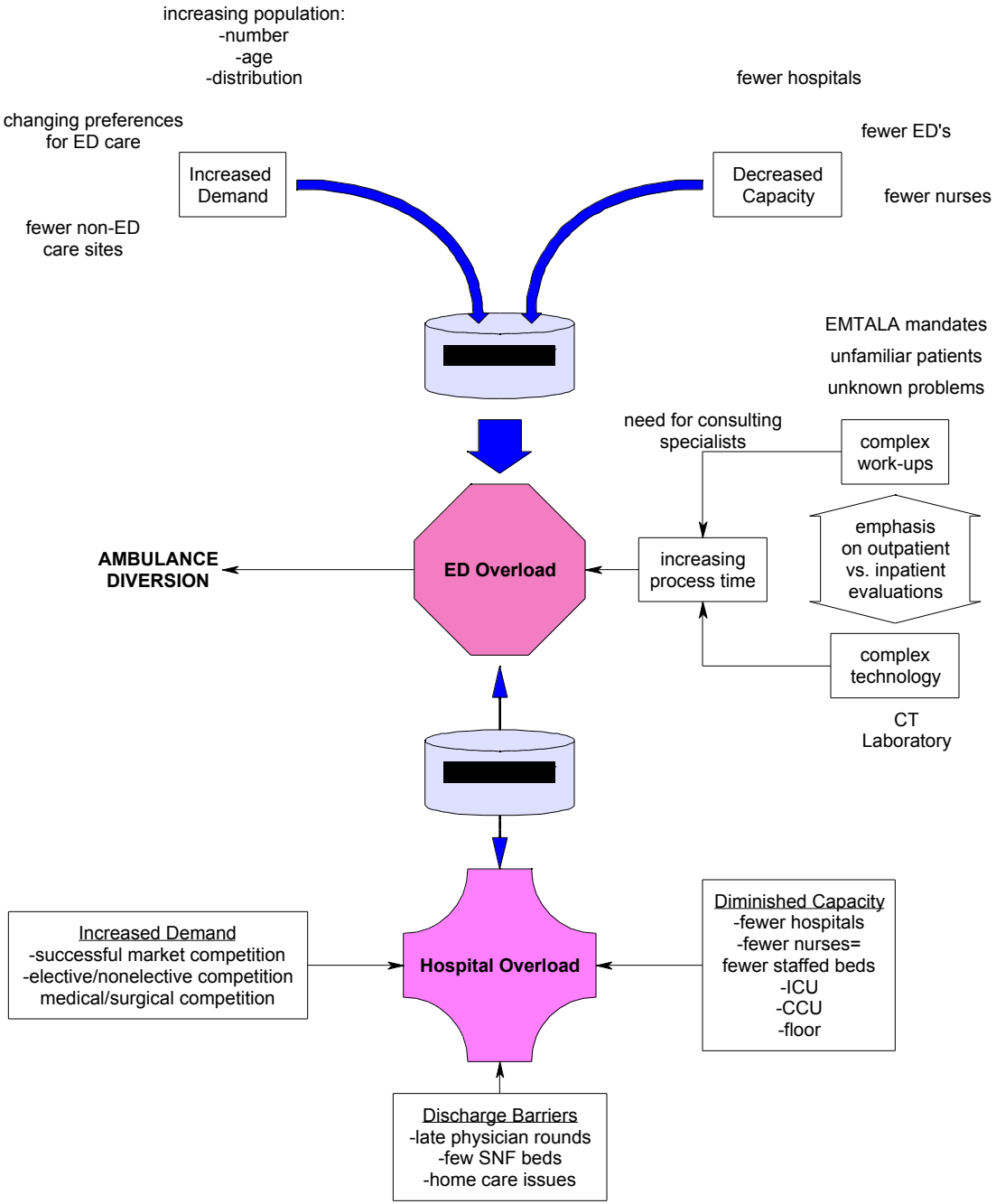
- Referral of patients under EMS control to a hospital other than the closest.
- Used when prompt, appropriate care cannot be insured.
- Originally intended as a short-term strategy for managing peaks in the demand for hospital services.

Ambulance diversion in the Commonwealth





- 2000 was “worst year ever”
- 2001 now “worst year ever”
- Diversion now a year-round problem
- In 2000, the ten busiest departments in region IV together accounted for nearly 4,800 diversion hours or



INFLOW

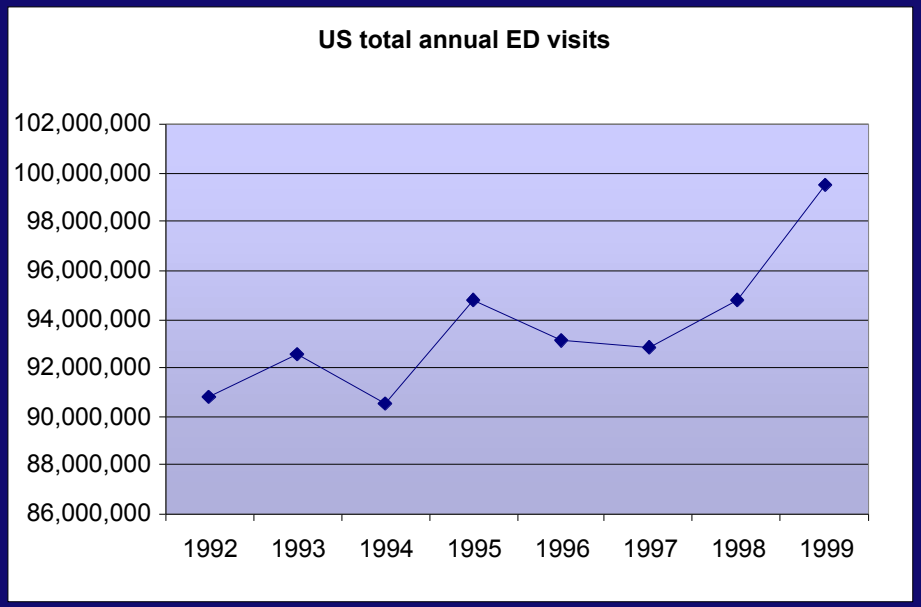
PROCESS

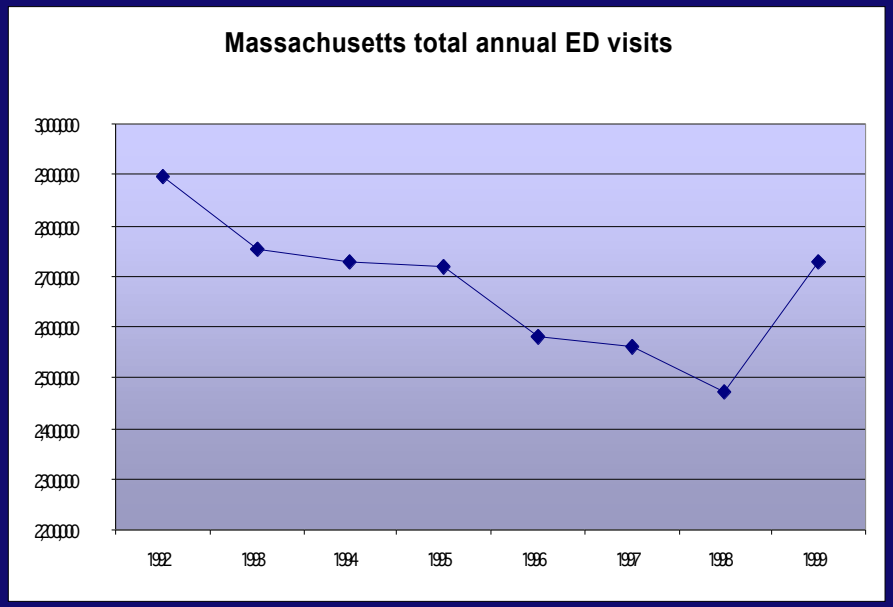
OUTFLOW

Three certainties:

- Demand for emergency services is increasing.
- Hospital supply is now far less than 1990.
- As capacity falls, it becomes increasingly difficult to match supply and demand.

Inflow: Demand for Emergency Services 1990–2000

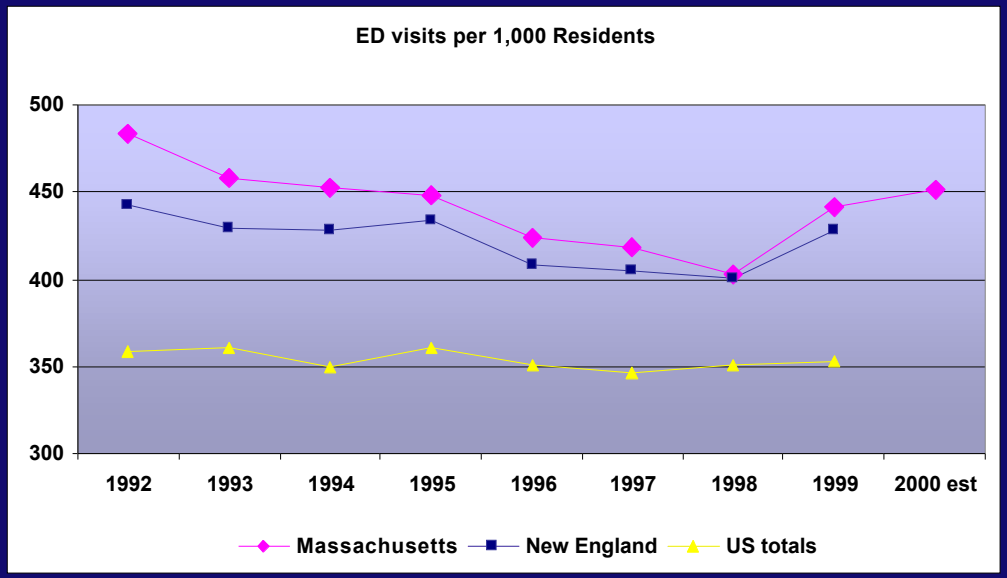


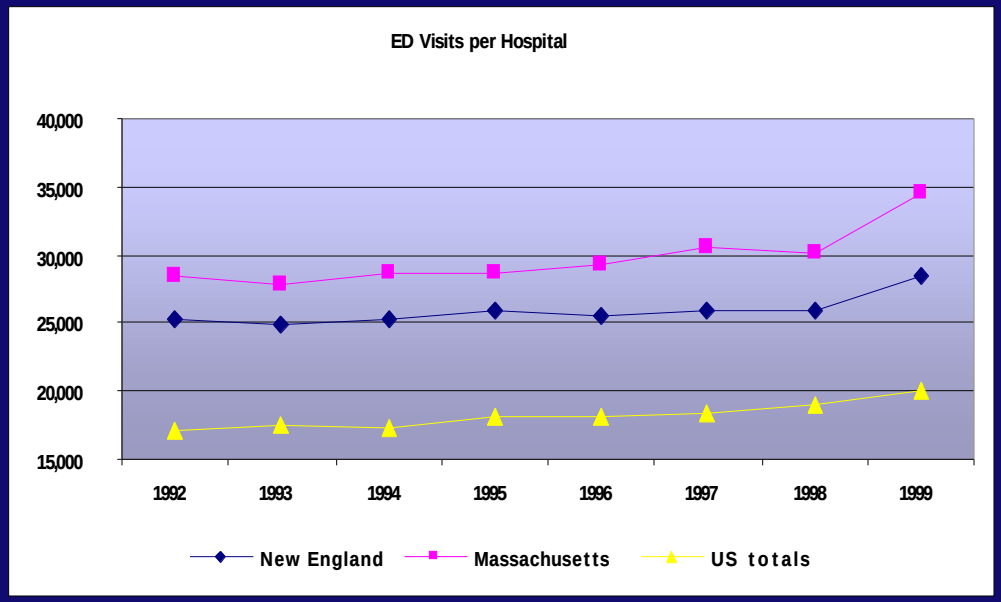


While total ED visits have been increasing nationwide, in Massachusetts they were declining…until 1999

Source: AHA

Inflow: Demand for Emergency Services 1990–2000



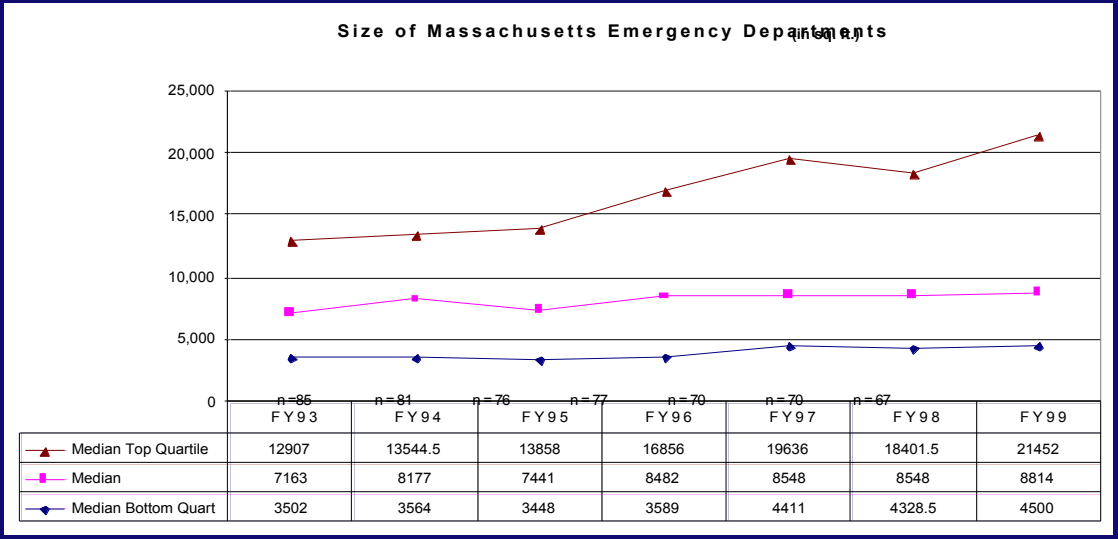


Visits have been stable nationally and had been declining in the Commonwealth.

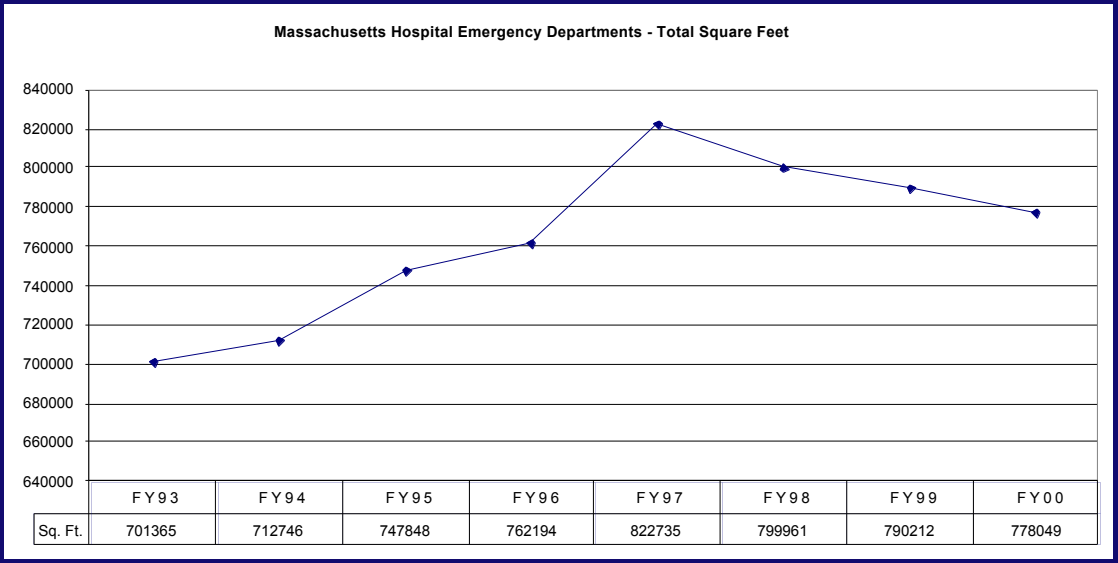
But after 1998, visits "bounced" off their lows and are now up sharply.

ED visits per hospital have always been far

Inflow: Supply of Emergency Services 1990–2000



	FY93	FY94	FY95	FY96	FY97	FY98	FY99
Median Top Quartile	12907	13544.5	13858	16856	19636	18401.5	21452
Median	7163	8177	7441	8482	8548	8548	8814
Median Bottom Quart	3502	3564	3448	3589	4411	4328.5	4500

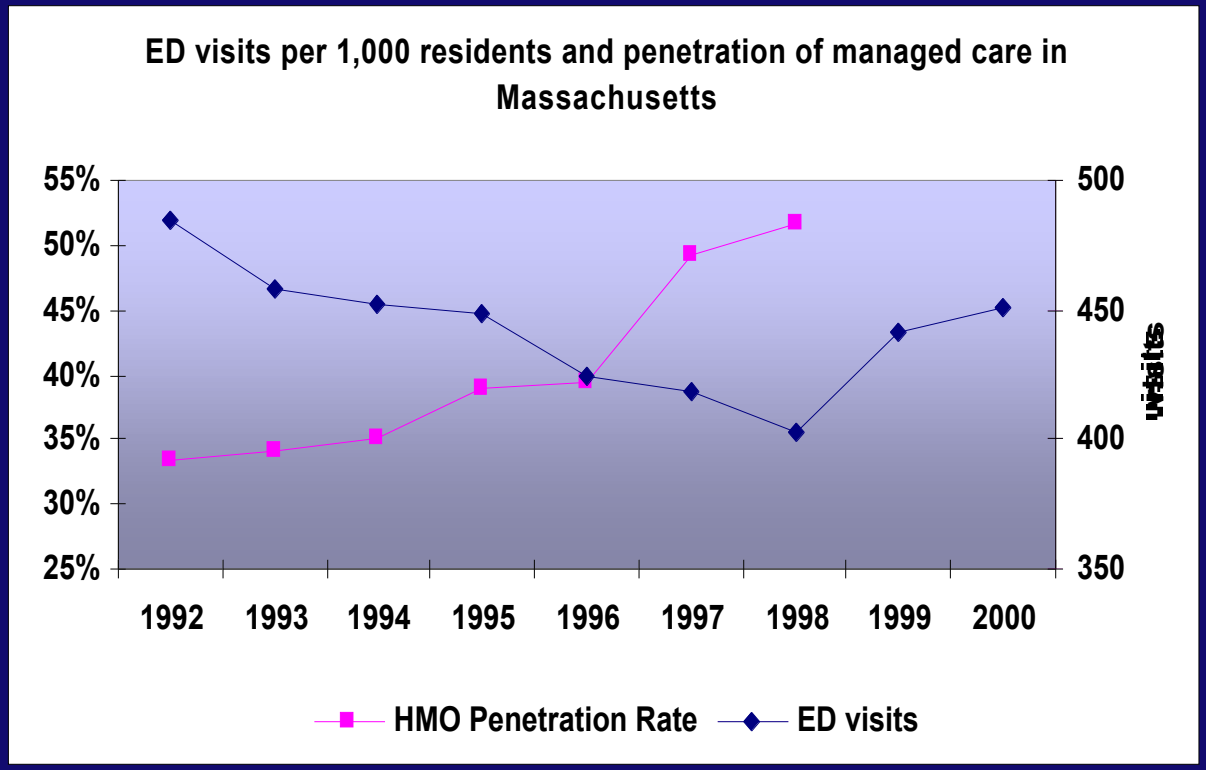


	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00
Sq. Ft.	701365	712746	747848	762194	822735	799961	790212	778049

The largest hospitals have responded by expanding emergency room capacity…

…but total statewide capacity is

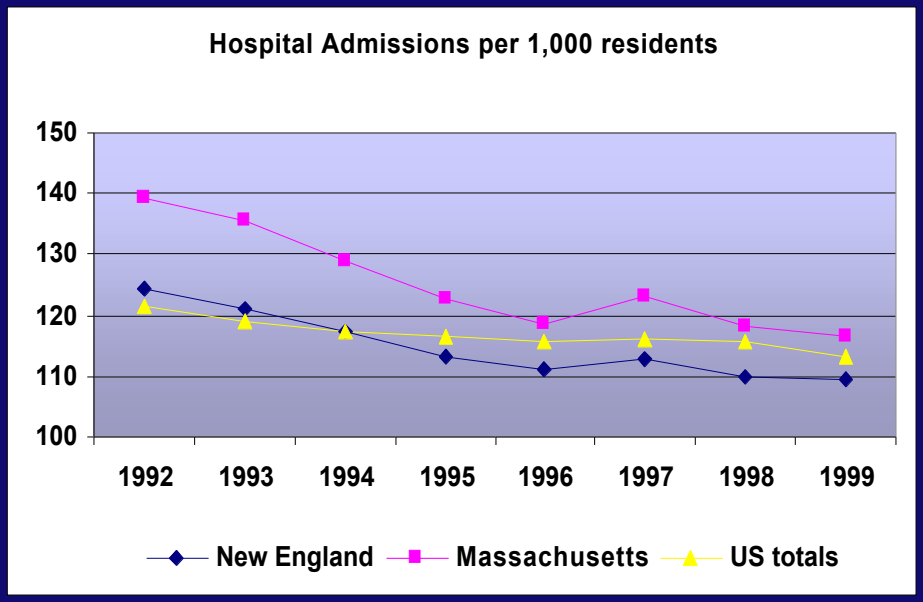
Inflow: Supply vs. Demand for Emergency Services 1990–2000

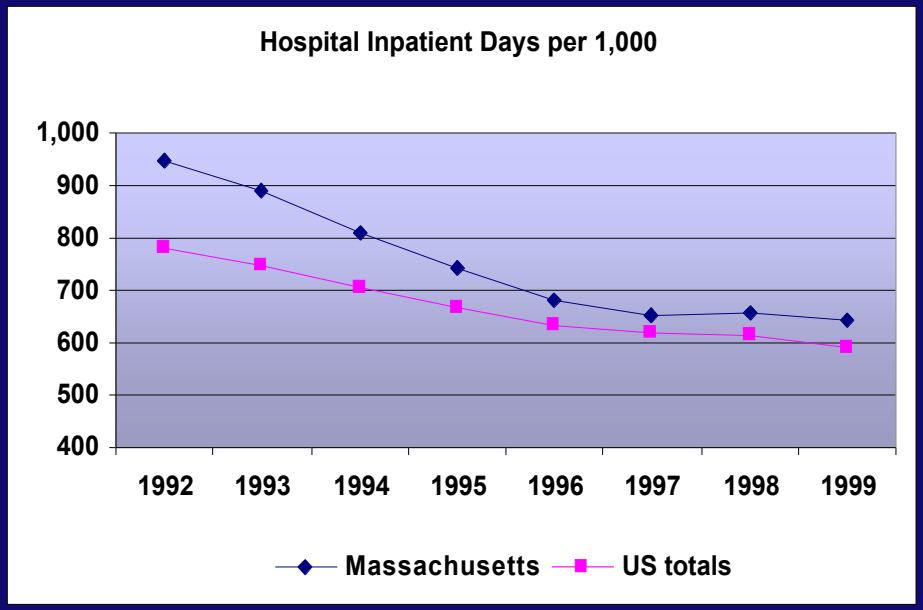


If demand now outstrips supply, why?

- Lost capacity
- Escaping managed care?
- Fewer alternatives?
- More "worried well"?
- Part of a natural

Outlook: Demand for hospital services 1996-2000

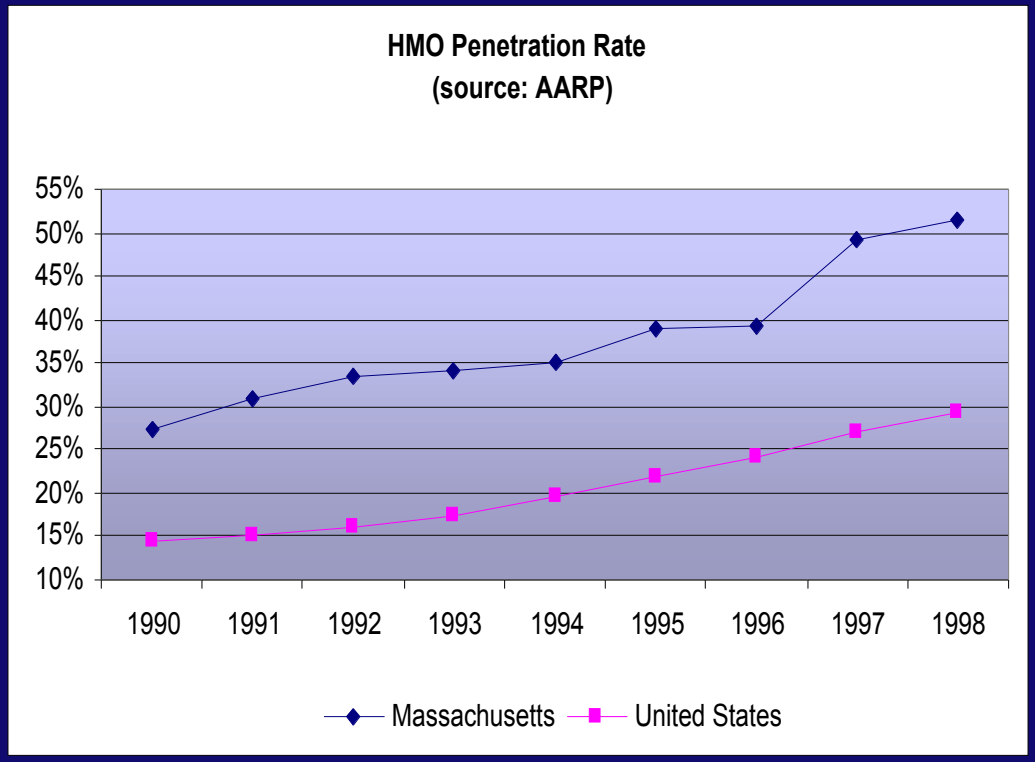




Admissions are now flat and, over the decade, have fallen in absolute numbers and

Total hospital days are now lower both and overall

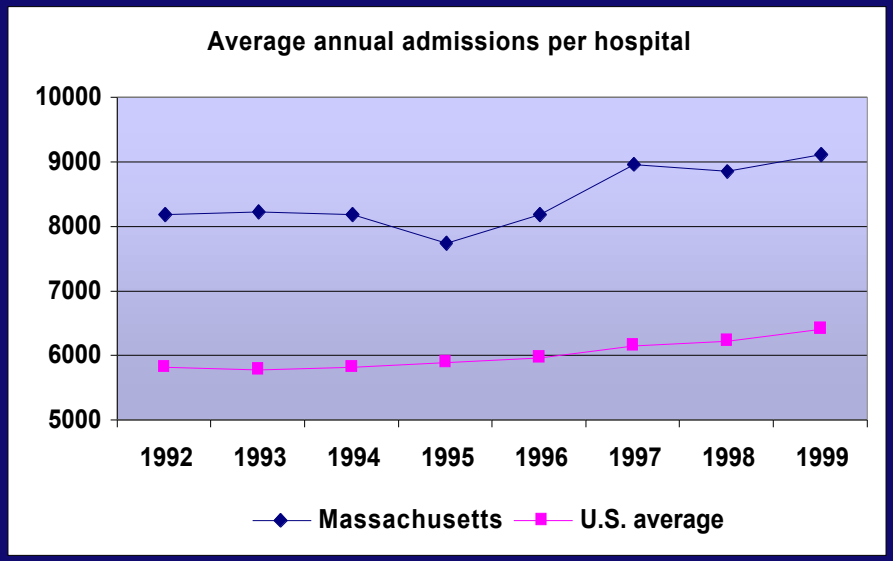
Outlook: Demand for hospital services 1990–2000

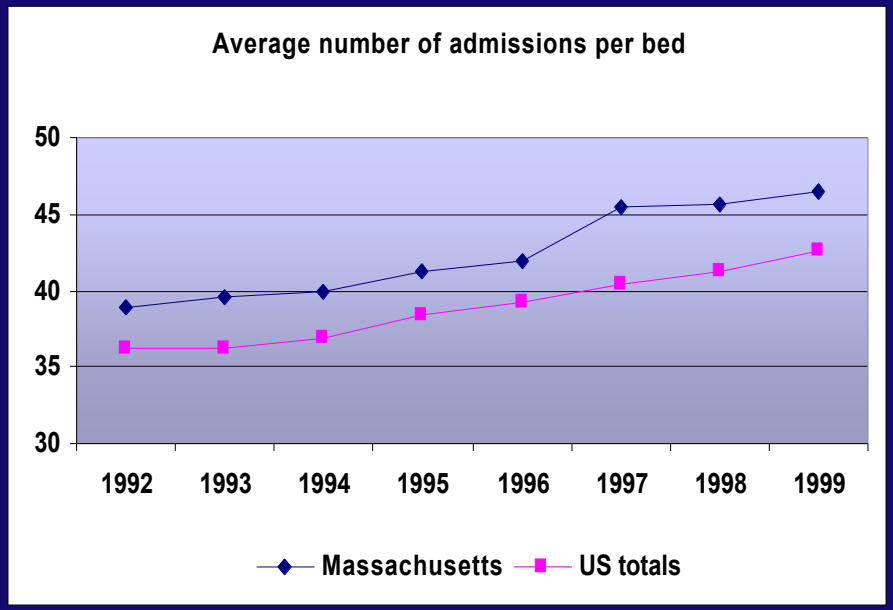


The decline correlates with higher managed care penetration rates.

Did this reflect "excess capacity" in the system?

Outflow: Matching supply to demand: inpatient services

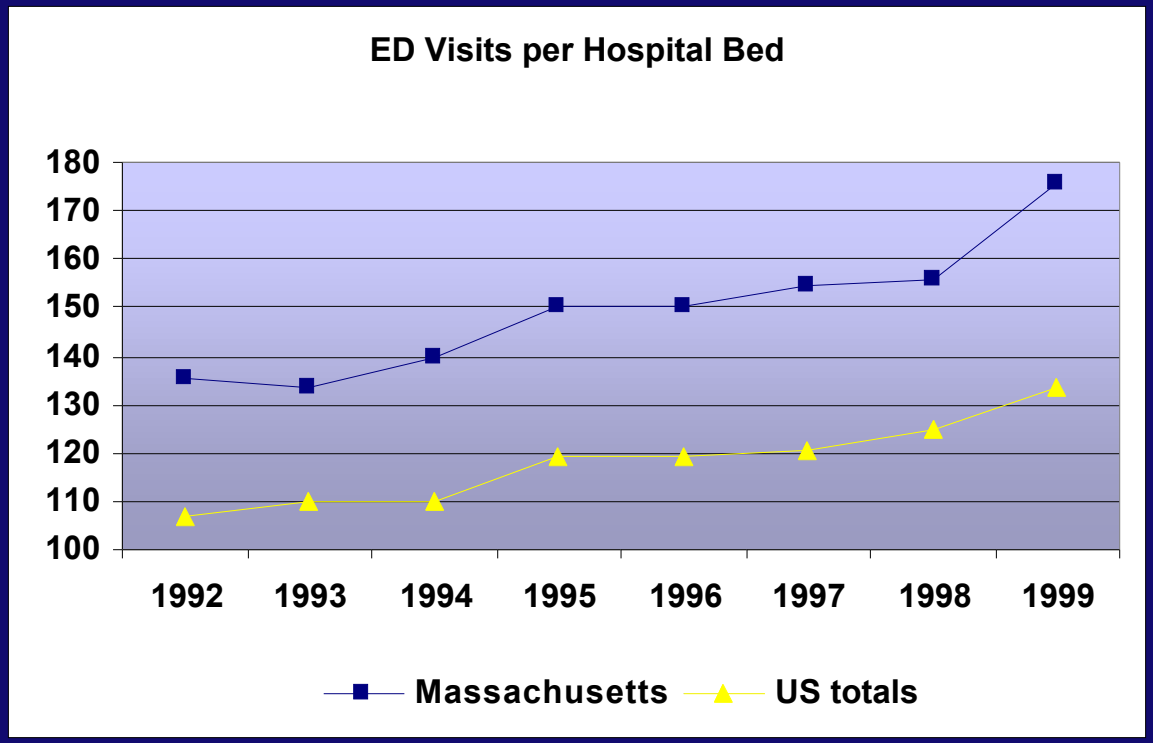




There are now more admissions per hospital and per hospital bed

This is particularly true for the most popular hospitals

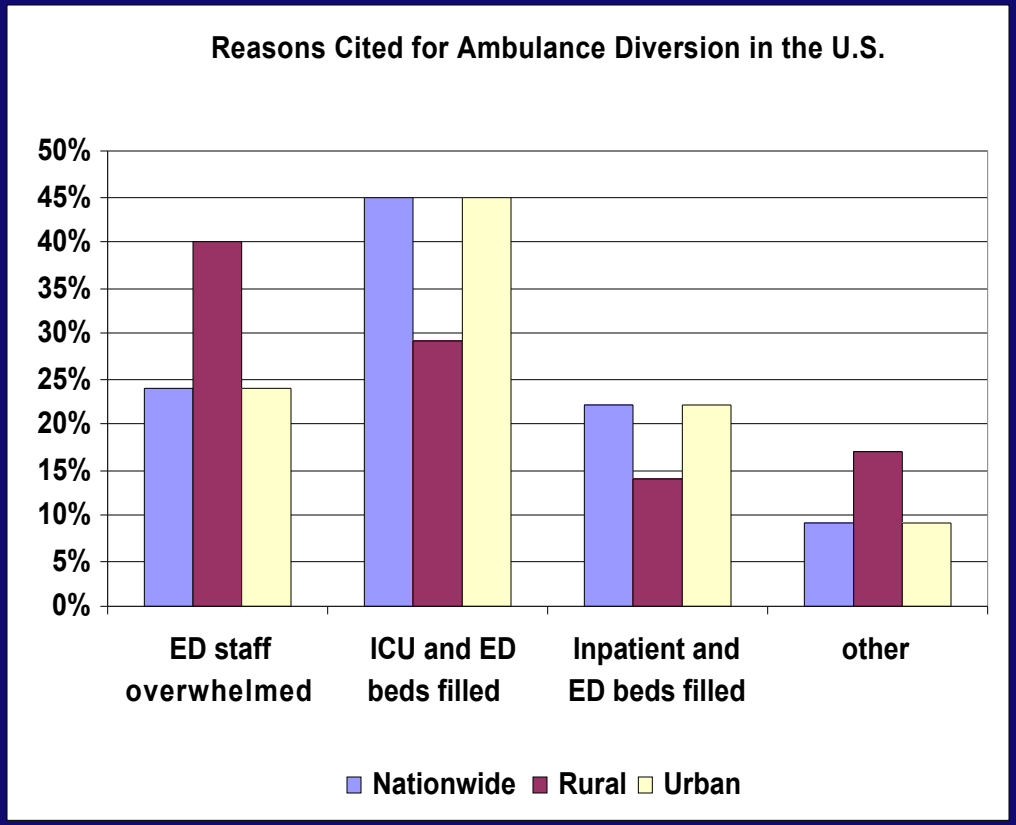
Outflow: Supply vs. Demand for Emergency Services 1990–2000



There are now many fewer beds standing behind Massachusetts ED visits

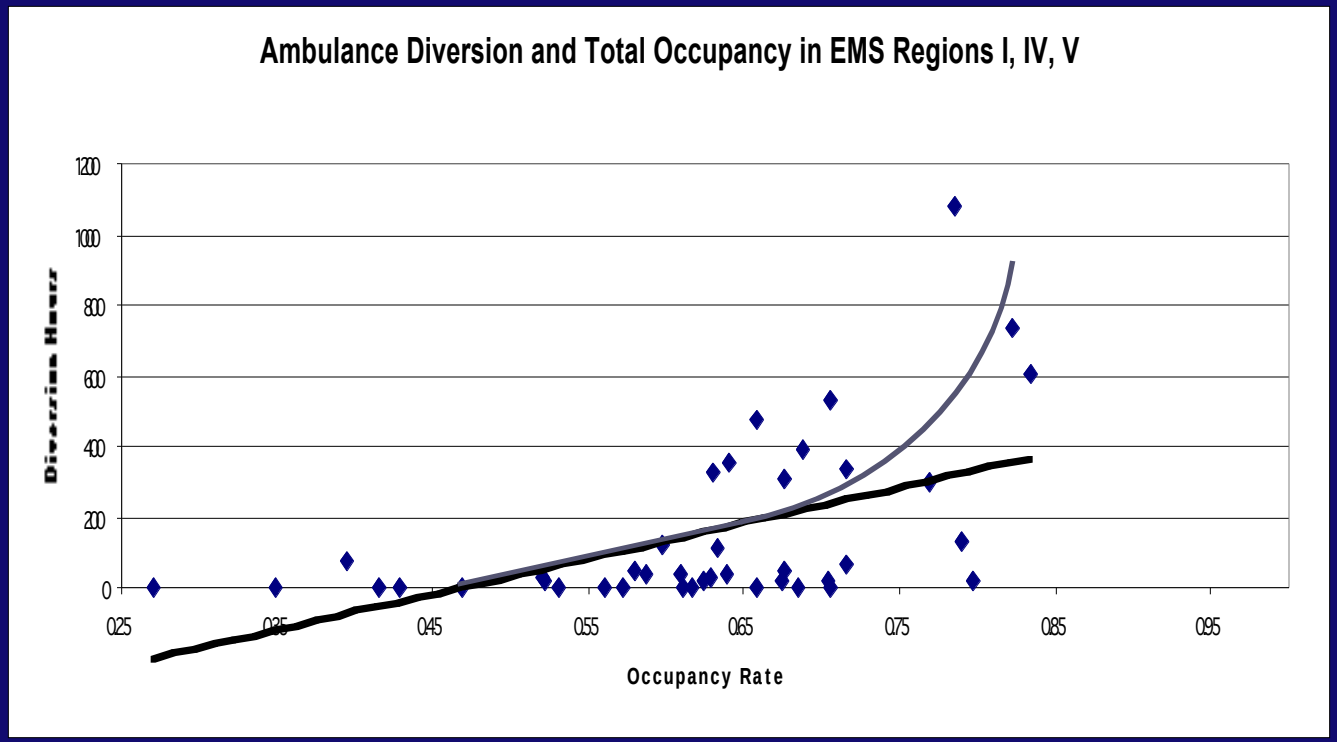
For the most popular hospitals, there are now up to 220 visits for

Who goes on diversion and why?



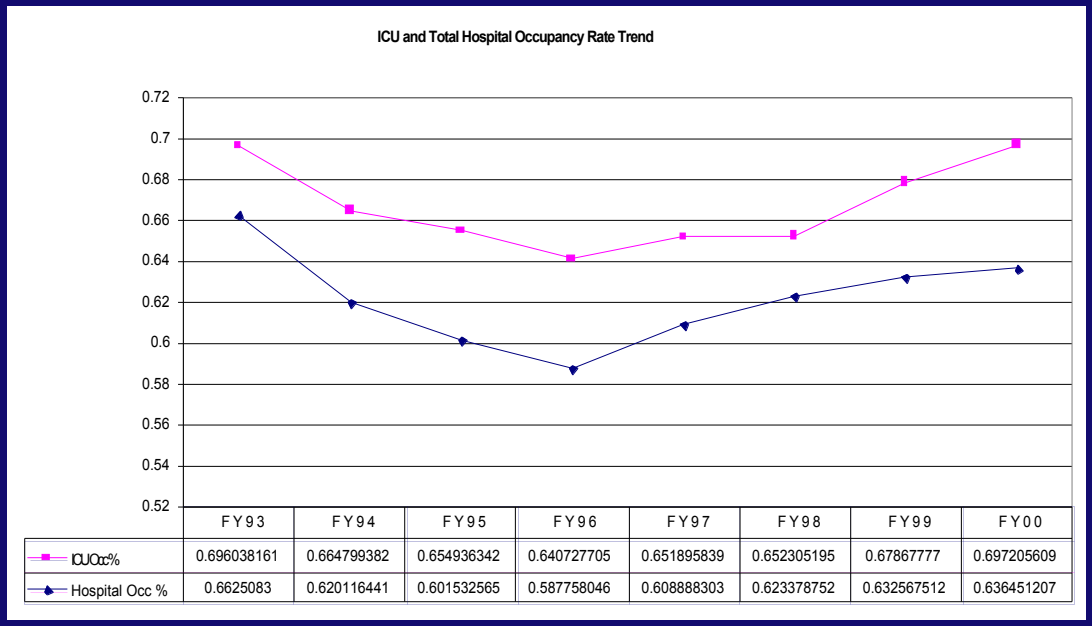
Historically, busy urban ED's handle their inflow volume but divert because their are full.

Who goes on diversion and why?

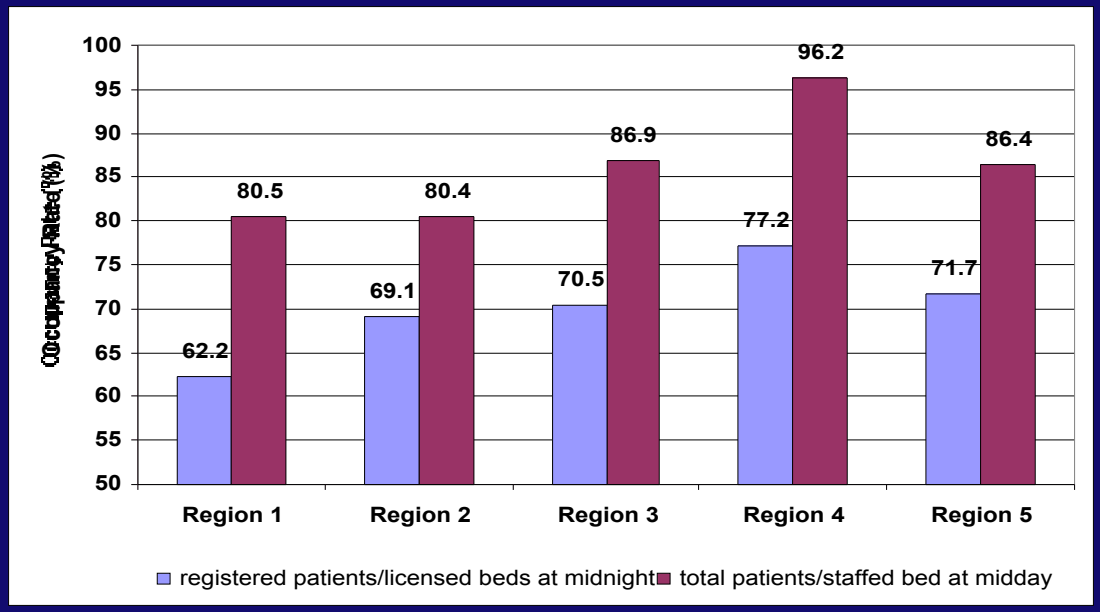


Frequency of diversion correlates better with total occupancy than with ED volume

How crowded are Massachusetts hospitals?



	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00
ICUOcc%	0.696038161	0.664799382	0.654936342	0.640727705	0.651895839	0.652305195	0.67867777	0.697205609
Hospital Occ %	0.6625083	0.620116441	0.601532565	0.587758046	0.608888303	0.623378752	0.632567512	0.636451207



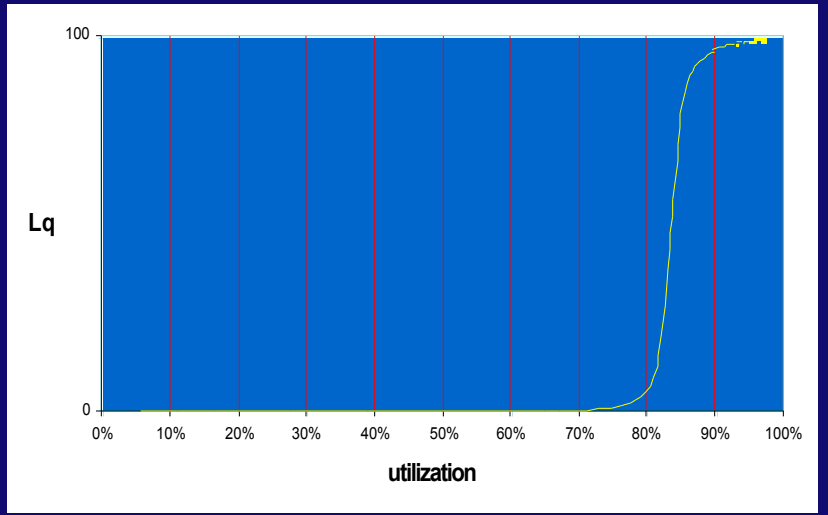
Occupancy depends on how you measure it.

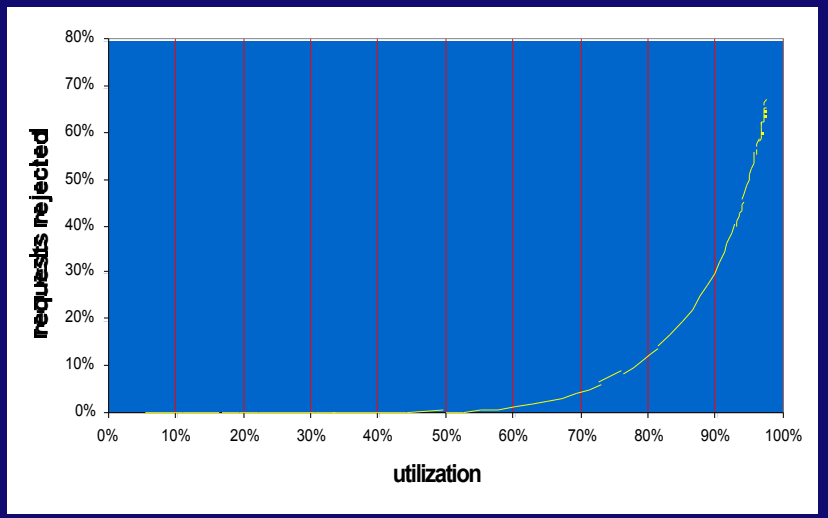
Real occupancy is higher than

Matching variable demand to fixed capacity: How crowded hospitals be?

Systems involving waiting lines behave in a characteristic fashion

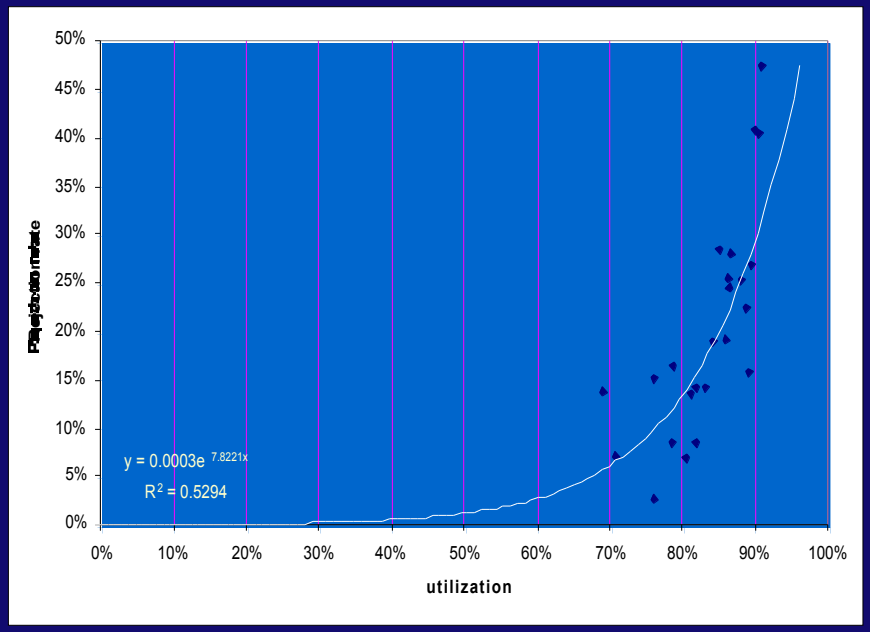
When inflow and service times are variable, the response to increasing utilization is





How crowded hospitals be?

This behavior has been observed in hospitals both here and abroad.



MA unit, 2-year experience

UK hospitals, Bagust, et. al. BMJ 1999;319:155-158

Conclusions

- Amidst increasing demand, there are now fewer ED's and they are attached to increasingly full hospitals. The degree of this fullness has not been appreciated and the "right" number has never been specified. In this setting, further capacity reductions carry significant risk.

- Hospitals are now forced toward very high census and controllable flow. ED's, as the only care site mandated by law to treat all arrivals, cannot control their flow. As a result, capacity limits appear in the ED first.

- Matching variable demand to falling capacity is the new health care challenge. It is a difficult problem which will require innovative solutions.

MHPF Recommendations

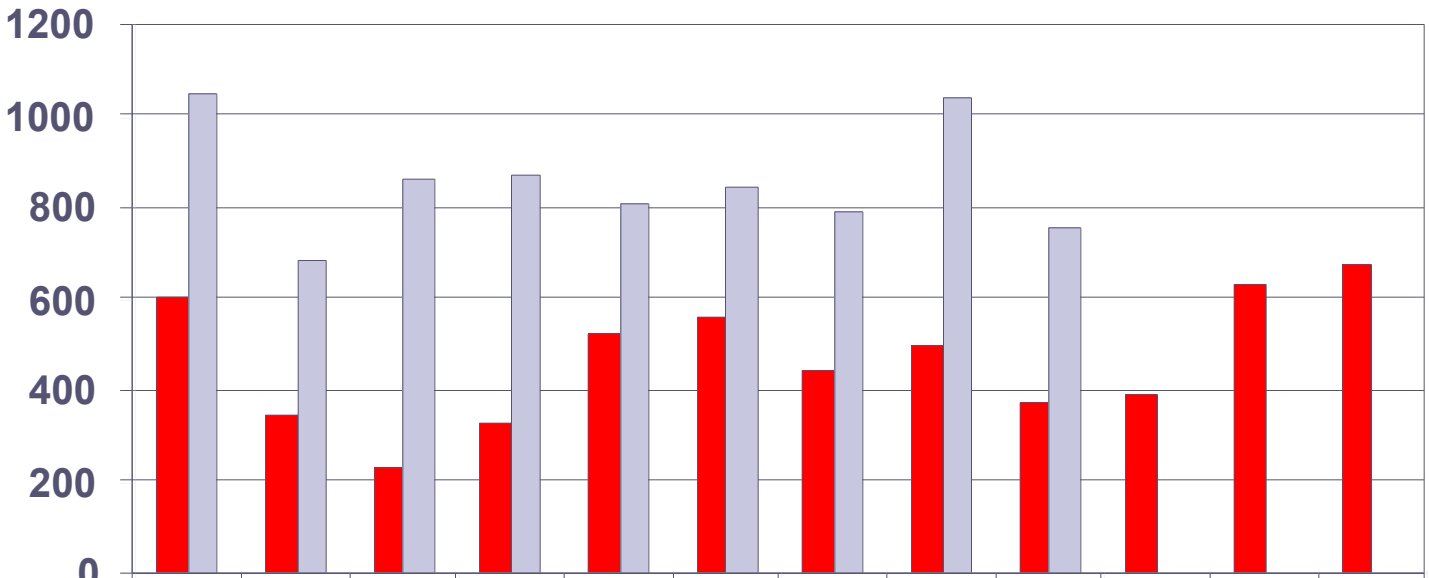
- *Determine the true nature of changing demand for emergency services and encourage access to medically-suitable alternatives.*
- *Develop and support operations management strategies for improving patient flow and relieving ED gridlock.*
- *Devise an ongoing method for measuring, monitoring, and adjusting overall hospital capacity.*
- *Address current health care workforce shortages.*

EMS Region 4 Diversion Hours

Monthly Comparison of Year 2000 to Year 2001

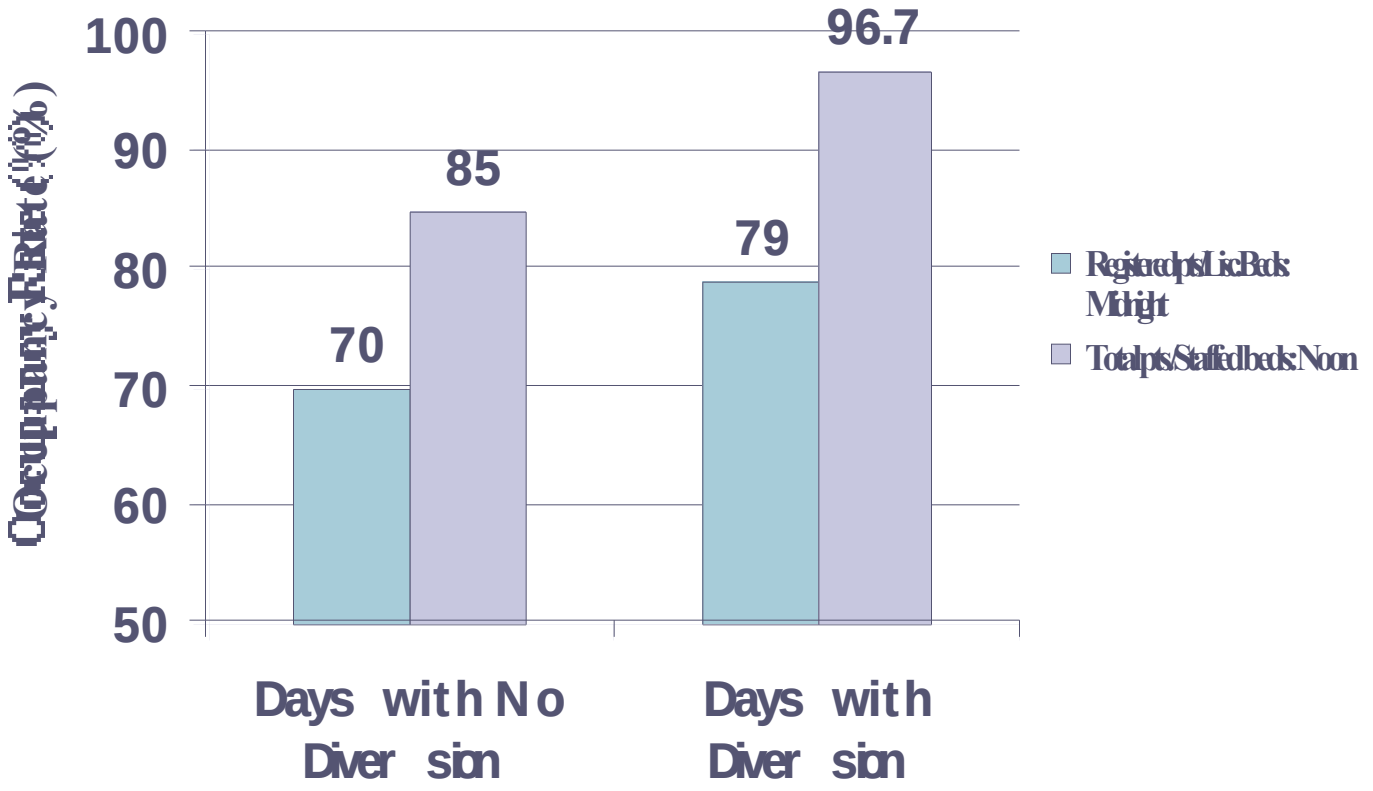
Year 2000 = 5,641.4 Total Hours

Year 2001 (Jan - Sept) = 7731.6 Total Hours

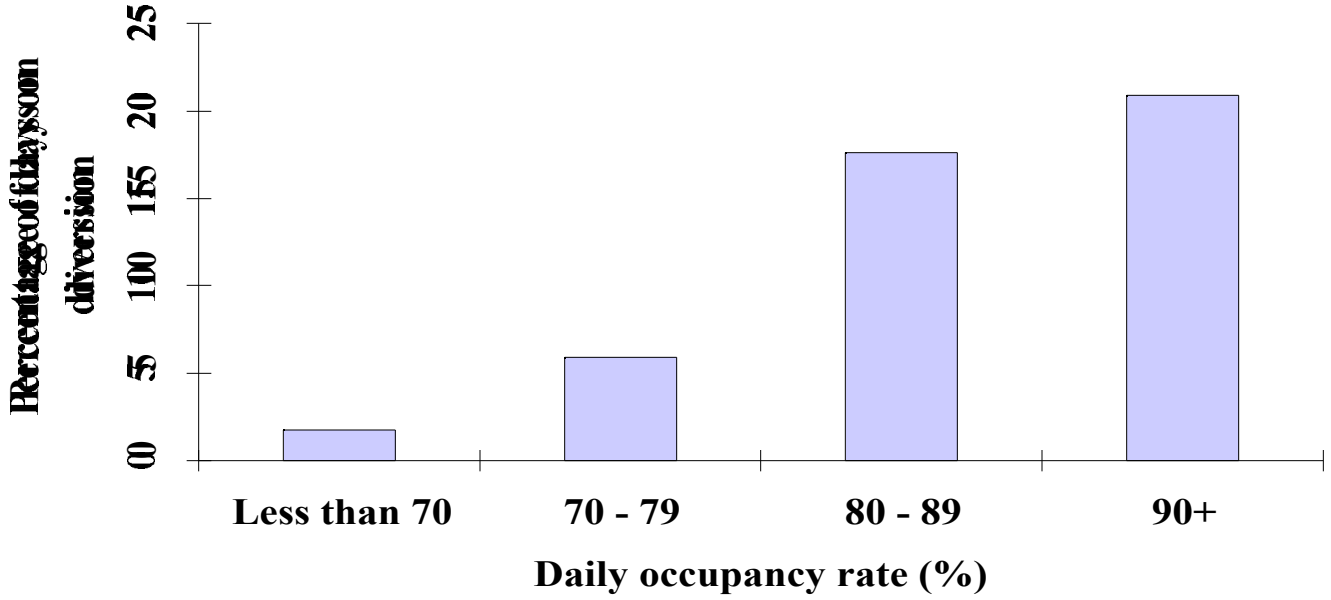


	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2000	611	344.5	236	329.75	530.08	557.83	450.5	497.75	380	396.25	630.75	677
2001	1052.5	690.5	862.25	874.25	807.3	844.5	792.5	1046.5	761.25			

Occupancy Rate by Diversion Status:
Highest and Lowest Occupancy Measures



Incidence of Diversion in Relation to Daily Occupancy Rates



MAJOR ACTIVITIES RELATED TO EFFORTS TO ADDRESS AMBULANCE DIVERSION

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ACTION STEPS TO ADDRESS DIVERSION/BOARDING OVER THE NEXT 6 MONTHS

- **Work with hospitals to assess expected demand for services by patients presenting through the ED over the next six months and to develop plans to meet that demand.**
- **Work with individual hospitals that have high frequency of ambulance diversions.**
- **Establish and implement triggered interventions in the event that ambulance diversion worsens**
- **Promote more coordinated use of system-wide resources among hospitals.**
- **Establish and implement uniform, statewide policies/rules governing diversion**